

CLAIMS

What is claimed is:

1. An apparatus, comprising:

an incomplete flip chip package to place into a bottom inner cavity of a lower mold portion, the incomplete flip chip package comprising a chip and a substrate, the chip having a top surface coupled by reflowed solder bumps with an upper surface of the substrate, the chip further comprising a bottom surface opposite the top surface and one or more side surfaces between the top and bottom surfaces;

a mold created by mating an upper mold portion with the lower mold portion, the upper mold portion having an upper inner cavity, including an upper inner surface which is coated with a release film, and the bottom surface of the chip butts against the upper inner surface, the lower mold portion having a lower inner surface, and the upper and bottom inner cavities forming a mold inner cavity enclosing the incomplete flip chip package, and forming a runner that has an upper portion that includes the release film coated on the upper inner surface of the upper mold portion, and a lower inner surface that includes the lower inner surface of the lower mold; and

a predetermined amount of a liquid resin to inject into the mold inner cavity through the runner, the liquid resin encapsulating substantially all or the one or more side surfaces and substantially all of the upper surface, the liquid resin further filling a gap between the top surface of the chip and an adjacent portion of the upper surface of the substrate, encapsulating the

reflowed solder bumps, and curing the liquid resin by maintaining the mold at an elevated temperature for a predetermined period of time, the elevated temperature being equal to or greater than the cure temperature of the filled liquid resin for the predetermined period of time.

2. The apparatus of claim 1, wherein the mold is separated between the upper mold portion and the lower mold portion to expose a molded chip package, the upper mold portion being removed with the release film.
3. The apparatus of claim 1, further comprising a monolithic element having solidified resin, the monolithic element encapsulating and adhesively bonded to (i) substantially all of the one or more side surfaces, (ii) a substantial portion of the upper surface, and (iii) the reflowed solder bumps located in the gap between the top surface of the chip and the adjacent portion of the upper surface of the substrate.
4. The apparatus of claim 1, wherein the liquid resin comprises silica microspheres.
5. The apparatus of the claim 3, wherein the solidified resin comprises an epoxy.
6. The apparatus of claim 1, wherein the substrate comprises a thin substrate of approximately 0.05 mm to .5 mm thickness.
7. The apparatus of claim 1, wherein the substrate comprises a polymeric material.
8. The apparatus of claim 1, further comprises a passive component electrically coupled with the substrate, the passive component comprising a resistor or a capacitor.

9. The apparatus of claim 3, wherein the solidified resin fills a gap between a first surface of the passive component and an adjacent surface of the substrate.
10. The apparatus of claim 9, wherein the solidified resin fully encapsulates the passive component.
11. A method, comprising:

placing an incomplete flip chip package into a bottom inner cavity of a lower mold portion, the incomplete flip chip package comprising a chip and a substrate, the chip having a top surface coupled by reflowed solder bumps with an upper surface of the substrate, the chip further comprising a bottom surface opposite the top surface and one or more side surfaces between the top and bottom surfaces;

mating an upper mold portion with the lower mold portion, the upper mold portion having an upper inner cavity, including an upper inner surface which is coated with a release film, and the bottom surface of the chip butts against the upper inner surface, the lower mold portion having a lower inner surface, and the upper and bottom inner cavities forming a mold inner cavity enclosing the incomplete flip chip package, and forming a runner that has an upper portion that includes the release film coated on the upper inner surface of the upper mold portion, and a lower inner surface that includes the lower inner surface of the lower mold;

injecting a predetermined amount of a liquid resin into the mold inner cavity through the runner, the liquid resin encapsulating substantially all or the

one or more side surfaces and substantially all of the upper surface, the liquid resin further filling a gap between the top surface of the chip and an adjacent portion of the upper surface of the substrate, encapsulating the reflowed solder bumps; and

curing the liquid resin by maintaining the mold at an elevated temperature for a predetermined period of time, the elevated temperature being equal to or greater than the cure temperature of the filled liquid resin for the predetermined period of time.

12. The method of claim 11, further comprising separating the mold between the upper mold portion and the lower mold portion to expose a molded chip package, the upper mold portion being removed with the release film.
13. The method of claim 11, further comprising a monolithic element having solidified resin, the monolithic element encapsulating and adhesively bonded to (i) substantially all of the one or more side surfaces, (ii) a substantial portion of the upper surface, and (iii) the reflowed solder bumps located in the gap between the top surface of the chip and the adjacent portion of the upper surface of the substrate.
14. A system, comprising:

a storage medium coupled with a chip;

an incomplete flip chip package to place into a bottom inner cavity of a lower mold portion, the incomplete flip chip package comprising the chip and a substrate, the chip having a top surface coupled by reflowed solder bumps

with an upper surface of the substrate, the chip further comprising a bottom surface opposite the top surface and one or more side surfaces between the top and bottom surfaces;

a mold created by mating an upper mold portion with the lower mold portion, the upper mold portion having an upper inner cavity, including an upper inner surface which is coated with a release film, and the bottom surface of the chip butts against the upper inner surface, the lower mold portion having a lower inner surface, and the upper and bottom inner cavities forming a mold inner cavity enclosing the incomplete flip chip package, and forming a runner that has an upper portion that includes the release film coated on the upper inner surface of the upper mold portion, and a lower inner surface that includes the lower inner surface of the lower mold; and

a predetermined amount of a liquid resin to inject into the mold inner cavity through the runner, the liquid resin encapsulating substantially all or the one or more side surfaces and substantially all of the upper surface, the liquid resin further filling a gap between the top surface of the chip and an adjacent portion of the upper surface of the substrate, encapsulating the reflowed solder bumps, and curing the liquid resin by maintaining the mold at an elevated temperature for a predetermined period of time, the elevated temperature being equal to or greater than the cure temperature of the filled liquid resin for the predetermined period of time.

15. The system of claim 14, wherein the mold is separated between the upper mold portion and the lower mold portion to expose a molded chip package, the upper mold portion being removed with the release film.
16. The system of claim 14, further comprising a monolithic element having solidified resin, the monolithic element encapsulating and adhesively bonded to (i) substantially all of the one or more side surfaces, (ii) a substantial portion of the upper surface, and (iii) the reflowed solder bumps located in the gap between the top surface of the chip and the adjacent portion of the upper surface of the substrate.
17. The system of claim 14, further comprises a passive component electrically coupled with the substrate, the passive component comprising a resistor or a capacitor.
18. A method, comprising:
placing an incomplete chip package into a mold, the incomplete chip package comprising a chip having a top surface coupled by reflowed solder bumps with an upper surface of the substrate, the chip having (i) a top surface facing the substrate, (ii) a bottom surface opposite the top surface, and (iii) one or more side surfaces between the top and bottom surfaces;
injecting a predetermined amount of a liquid resin into the mold through a runner, the liquid resin encapsulating substantially all or the one or more side surfaces and substantially all of the upper surface of the substrate, the liquid resin further filling a gap between the top surface of the chip and an

adjacent portion of the upper surface of the substrate, encapsulating the reflowed solder bumps; and

curing the liquid resin by maintaining the mold at an elevated temperature for a predetermined period of time, the elevated temperature being equal to or greater than the cure temperature of the filled liquid resin for the predetermined period of time.

19. The method of claim 18, further comprising separating the mold between an upper mold portion and a lower mold portion to expose a molded chip package.
20. The method of claim 18, further comprising a monolithic element having solidified resin, the monolithic element encapsulating and adhesively bonded to (i) substantially all of the one or more side surfaces, (ii) a substantial portion of the upper surface, and (iii) the reflowed solder bumps located in the gap between the top surface of the chip and the adjacent portion of the upper surface of the substrate.
21. An apparatus, comprising:
an incomplete chip package to place into a mold, the incomplete chip package comprising a chip having a top surface coupled by reflowed solder bumps with an upper surface of the substrate, the chip having (i) a top surface facing the substrate, (ii) a bottom surface opposite the top surface, and (iii) one or more side surfaces between the top and bottom surfaces; and
a predetermined amount of a liquid resin to inject into the mold through a runner, the liquid resin encapsulating substantially all or the one or more side surfaces and substantially all of the upper surface of the substrate, the

liquid resin further filling a gap between the top surface of the chip and an adjacent portion of the upper surface of the substrate, encapsulating the reflowed solder bumps, and curing the resin by maintaining the mold at an elevated temperature for a predetermined period of time, the elevated temperature being equal to or greater than the cure temperature of the filled liquid resin for the predetermined period of time.

22. The apparatus of claim 21, wherein the mold between an upper mold portion and a lower mold portion is separated to expose a molded chip package.
23. The apparatus of claim 21, further comprising a monolithic element having solidified resin, the monolithic element encapsulating and adhesively bonded to (i) substantially all of the one or more side surfaces, (ii) a substantial portion of the upper surface, and (iii) the reflowed solder bumps located in the gap between the top surface of the chip and the adjacent portion of the upper surface of the substrate.
24. The apparatus of claim 21, further comprises a passive component electrically coupled with the substrate, the passive component comprising a resistor or a capacitor.
25. The apparatus of claim 23, wherein the solidified resin fills a gap between a first surface of the passive component and an adjacent surface of the substrate.
26. The apparatus of claim 25, wherein the solidified resin fully encapsulates the passive component.

27. A system, comprising:
- a storage medium coupled with a chip;
- an incomplete chip package to place into a mold, the incomplete chip package comprising the chip having a top surface coupled by reflowed solder bumps with an upper surface of the substrate, the chip having (i) a top surface facing the substrate, (ii) a bottom surface opposite the top surface, and (iii) one or more side surfaces between the top and bottom surfaces; and
- a predetermined amount of a liquid resin to inject into the mold through a runner, the liquid resin encapsulating substantially all or the one or more side surfaces and substantially all of the upper surface of the substrate, the liquid resin further filling a gap between the top surface of the chip and an adjacent portion of the upper surface of the substrate, encapsulating the reflowed solder bumps, and curing the resin by maintaining the mold at an elevated temperature for a predetermined period of time, the elevated temperature being equal to or greater than the cure temperature of the filled liquid resin for the predetermined period of time.
28. The system of claim 27, wherein the mold between an upper mold portion and a lower mold portion is separated to expose a molded chip package.
29. The system of claim 27, further comprising a monolithic element having solidified resin, the monolithic element encapsulating and adhesively bonded to (i) substantially all of the one or more side surfaces, (ii) a substantial portion of the upper surface, and (iii) the reflowed solder bumps located in the gap between

the top surface of the chip and the adjacent portion of the upper surface of the substrate.

30. The system of claim 27, further comprises a passive component electrically coupled with the substrate, the passive component comprising a resistor or a capacitor.